METHOD OF CONTROLLING INK SUCTION AMOUNT OF INK JET PRINTER

CLAIMS

[Claim(s)]

[Claim 1] An amount control method of ink suction of an ink jet printer characterized by detecting ink temperature in a print head, controlling rotational speed and turnover time of a motor which drive a tube pump which attracts ink from each nozzle of a print head according to this detection temperature, and adjusting the amount of ink suction.

[Claim 2] An amount control method of ink suction of an ink jet printer according to claim 1 which memorizes rotational speed and turnover time of a motor which drive a tube pump beforehand corresponding to temperature, and carries out drive control of the above-mentioned motor by motor rotational speed and turnover time corresponding to detection temperature.

[Claim 3] An amount control method of ink suction of an ink jet printer according to claim 1 or 2 of detecting head temperature or temperature near the arm head instead of detecting ink temperature in a print head.

[Claim 4] A motor which drives the above-mentioned tube pump is the amount control method of ink suction of an ink jet printer according to claim 1, 2, or 3 which consists of pulse motors and is controlled by movement magnitude of this motor instead of turnover time of the above-mentioned motor.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the ink suction method when removing air bubbles and a contaminant from the ink pressure interior of a room of the print head in an ink jet printer.

[0002]

[Description of the Prior Art] In an ink cartridge exchange type ink JIENTTO printer, when exchanging ink cartridges, air bubbles and dust may mix in the ink pressure interior of a room of a print head. If it prints after air bubbles and a contaminant have mixed, ink will not be injected from the nozzle which air bubbles and a contaminant mixed in the ink pressure interior of a room, but a dot omission will arise. In such a case, he attracts the ink of the ink pressure interior of a room, and is trying to take out air bubbles and a contaminant with ink. Drawing 4 is drawing showing the outline of the tube pump 1 for attracting this ink. The rotor 5 equipped with three rollers 4 meets an inside at the stator 3 equipped with the wall 2, it is arranged at the same axle, and the tube 6 by which the end was connected to the protective cap 9 in accordance with the inside of a peripheral wall 2 is arranged. If drive rotation of the rotor 5 is carried out, a roller 4 rotates, and while at least two rollers 4 crush a tube 6 to coincidence, it will move. The ink in a tube while being inserted with two rollers 4 is extruded outside by this, and pump actuation is performed.

[0003] In drawing 4 , a sign 7 is a print head, is equipped with the nozzle train 8 of an ink jet type, and carries out both-way migration of the front face of a platen along with a carriage shaft. By a diagram, it is located in a home position. The nozzle train 8 is countered, a protective cap 9 is arranged, and it moves to a print head 7 by the spring 10 and the cam 11. A protective cap 9 has the shape of a container in which the print head side carried out the opening, and is equipped with a building envelope. As for the sign 12, the cam-like valve 13 is arranged on the way by the pressure release tube. The end of the above-mentioned tube 6 is opened for free passage and connected to the building envelope of a protective cap 9, and the other end is released by ink reservoir via the tube pump 1. The end of the pressure release tube 12 is opened for free passage and connected to the building envelope of a protective cap 9, and the other end is wide opened by atmospheric air through the valve 13.

[0004] By connecting the switch gear 14 to an idle gear 15 side, the tube pump 1 is driven by the maintenance motor M3. if the switch gear 14 is connected to an idle gear 17 side -- a protective cap 9 and a valve 13 -- or although not illustrated, a wiper etc. drives. In addition, these components and devices are summarized as maintenance equipment in the printer. When attracting ink from each nozzle of a print head 7, it is in the condition which pressed the protective cap 9 to the print head 7, and the valve 13 makes the free passage of the pressure release tube 12 the cut off state, the switch gear 14 is connected to an idle gear side, and the rotation drive of the tube pump 1 is counterclockwise carried out in drawing by the maintenance motor M3. Since a protective cap 9 covers the nozzle train 8, it is stuck to it by the print head 7 and the valve 13 is intercepting the free passage of the pressure release tube 12, the building envelope of a protective cap 9 serves as negative pressure, and has the composition of attracting ink all at once from each nozzle tip of the nozzle train 8.

[0005]

[Problem(s) to be Solved by the Invention] Ink viscosity changes with ink temperature. And

the case where air bubbles and a contaminant do not fall out even if it will attract ink on certain conditions, if ink viscosity changes arises. In a high temperature condition, since ink viscosity is low, ink tends [especially] to flow. Therefore, as mentioned above, since suction of ink is performed through a wrap protective cap in all the nozzles (for example, 60 nozzles) of a print head 7, the amount of suction of ink may decrease from the nozzle of the passage where ink is attracted from the nozzle of the passage where ink tends to flow, and ink cannot flow easily, and picking **** of air bubbles and a contaminant may become difficult.

[0006] In order to improve this, according to the worst conditions (at the time of an elevated temperature), set up suction conditions or the cross section of the ink passage of each nozzle chooses the same thing, or it copes with performing hydrophilization processing to ink passage so that the ink flow rate in the ink passage of each nozzle may become homogeneity etc., and is made to make passage resistance of ink passage into homogeneity conventionally. However, if suction conditions are performed on the worst conditions, the amount of ink suction will increase and ink will be consumed vainly. Moreover, it is also difficult to manufacture the cross section of the ink passage of each nozzle identically, and there is a problem which, if the worst happens, says the yield of a product arm head after all. If hydrophilization processing is furthermore performed to ink passage, the part head manufacturing cost will be made to increase. Then, the purpose of this invention is to offer the amount control method of ink suction which makes the amount of ink suction an optimum value according to ink viscosity.

[0007]

[Means for Solving the Problem] This invention is doubled with ink viscosity and enabled it to remove air bubbles and a contaminant from an ink pressure room of a print head certainly by detecting ink temperature in a print head, controlling rotational speed and turnover time (or movement magnitude) of a motor which drive a tube pump which attracts ink from each nozzle of a print head according to this detection temperature, and adjusting ink suction speed and the amount of ink suction. In order to make it briefer especially, corresponding to temperature, motor rotational speed and turnover time of a tube pump are memorized beforehand, and it is made to carry out drive control of the above-mentioned motor by motor rotational speed and turnover time corresponding to detection temperature. Moreover, head temperature or temperature near the arm head is detected instead of detecting ink temperature in a print head.

[0008]

[Function] The optimal amount of ink suction and suction speed according to ink viscosity are obtained by detecting the ink temperature of the ink pressure interior of a room, or considering that head temperature or the temperature near the arm head is the ink temperature of the ink pressure interior of a room, detecting it instead of ink temperature, and controlling the rotational speed and the turnover time of a motor which drive the tube

pump which attracts ink from each nozzle of a print head according to this detection temperature.

[0009]

[Example] Drawing 1 is the block diagram of the control section of an ink jet printer which carries out one example of this invention. The printer control section 20 consists of ROM22, RAM23, the I/O circuit 24, and drivers 25-28 which were connected to the processor 21 and this processor by bus 29, and the fundamental control program which a processor 21 performs is memorized by ROM22. It is used for the memory of data etc. at RAM23. Moreover, the table TB which memorizes actuation conditions is memorized in the maintenance motor M3 which drives the tube pump 1 according to ink temperature conditions as shown in drawing 2 with regards to this invention into the non-volatile portion (portion which it is backed up with a battery etc. and constituted by the non-volatile) of ROM22 or RAM23. The various sensors of a printer and an actuator were connected to the I/O circuit 24, and it is equipped with the port for data reception. The temperature sensors 30, such as a thermistor, and the operation panel 31 are connected as a thing especially related to this invention, and only these means are illustrated. In this example, the temperature sensor 30 which detects the ambient temperature near a print head is formed instead of detecting ink temperature, and this temperature sensor 30 is arranged inside the printer. A driver 25 drives a print head 32, a driver 26 drives the carriage motor (CR motor) M1, the paper feed motor (PF motor) M2 which driver 27- makes rotate a platen and sends a print form is connected, and a driver 28 drives the maintenance motor M3 which drives a tube pump etc. In addition, these motors M1-M3 consist of pulse motors. Moreover, explanation that the configuration of the control section of the above-mentioned printer is the same as that of that of the former and detailed is omitted.

[0010] First, the drive conditions (motor speed, motor turnover time) of a tube pump motor over temperature make the table TB as shown in drawing 2 beforehand prepared in the non-volatile portion of ROM22 or RAM23 carry out setting storage. even if the maker sets up beforehand, the user who uses this printer may be made to set up the drive conditions of the above-mentioned maintenance motor M3 according to an operating condition etc. from the operation panel which is not a drawing example, when the maker who manufactures this printer in memorizing to ROM22 sets up beforehand and sets it as RAM23

[0011] Temperature is classified into a three-stage in the example shown by drawing 2 . The 1st field more than temperature T1 (for example, 30 degrees C), It classifies into three partitions of the 2nd field more than temperature T2 (for example, 15 degrees C), and the 3rd field below temperature T2. less than [temperature T1] -- since -- In the 1st field beyond temperature T1, the motor speed V1 (for example, 800pps(es) are set up as an amount of pulses which moves in 1 second from a motor being a pulse motor), The motor turnover time t1 (for example, 6sec(s)) is set up. In the 2nd field of temperature T1-T2 The motor speed V2 (800pps), In the motor turnover time t2 (4sec) and the 3rd field below

temperature T2, the motor speed V3 (600pps) and the motor turnover time t3 (4sec) are set up. In addition, in an actual temperature setup, temperature T1 is set up to the 1st field, temperature T2 is set up to the 2nd field, and the temperature of this field is not set up for the 3rd field as less than [temperature T2].

[0012] Then, if an ink suction command is inputted from the operation panel 31 in the condition that the protective cap 9 is made by the print head 7 when ink cartridges are exchanged, or when a dot omission arises in printing, a processor 21 will start the processing shown in drawing 3 with a flow chart. First, if it is not more than laying temperature T1 about ****** more than 1 [laying temperature T] a processor 21 reads the temperature T detected with a temperature sensor 30 (step S1) and this detection temperature T is memorized to the 1st field of Table TB, more than 2 [laying temperature T] it is set as the 2nd field, it will judge to which temperature setting field it judges whether it is and detection temperature belongs (steps S2 and S3). the detection temperature T -- the field beyond laying temperature T1 -- a group -- then -- coming -- being alike -- While driving the maintenance motor M3 at the motor speed V1 set as this field of Table TB Set up the motorised time amount t1 set as the timer A formed in the processor to this field, start Timer A, and a down count is carried out (step S4, S5). If it judges whether this timer A became below "0" (step S6) and becomes below "0", the drive of the maintenance motor M3 will be stopped (step S13), and the processing concerned will be finished.

[0013] Moreover, if it is more than laying temperature T2 of the 2nd field (steps S2 and S3), while detection temperature is lower than laying temperature T1, and driving the maintenance motor M3 at the motor speed V2 set as the 2nd field If the motorised time amount t2 set as Timer A to this field is set up, Timer A is started (steps S7 and S8) and this timer A becomes below "0" (step S9), the drive of the maintenance motor M3 will be stopped (step S13). Moreover, when the detection temperature T is not more than laying temperature T1 or more than T2, either Since the detection temperature T is the 3rd field, while it drives the maintenance motor M3 at the motor speed V3 If the motorised time amount t3 is set as Timer A, Timer A is started (steps S10 and S11) and this timer A becomes below "0" (step S12), the drive of the maintenance motor M3 will be stopped (step S13).

[0014] Since a setup-time drive will be carried out at the motor speed set up according to the detection temperature T in the maintenance motor M3 as mentioned above, only the time amount for which it was suitable at the motor speed suitable for ink temperature (ambient temperature near the print head) will be driven, and only the optimal amount will be attracted at suction speed with the optimal ink of the ink pressure interior of a room. That is, the ink between the tubes 6 crushed by coincidence with two rollers 4 which a rotor 5 rotates through the switch gear 14 and an idle gear 15, and rotate with a rotor 5 by rotation of the maintenance motor M3 is discharged by ink reservoir. Consequently, the suction speed of the amount of ink attracted from each nozzle of a print head 7 with the rotational

speed of the maintenance motor M3 is decided, and the amount of suction ink is decided by the turnover time (rotation) of the maintenance motor M3.

[0015] In addition, although temperature is divided into three fields and the motor speed drive time amount of each field was set up and changed in the above-mentioned example, temperature may be classified further, for example, you may make it n field. In this case, more than laying temperature T1 by which the detection temperature T is set as the 1st field and laying temperature Tn-1 set as more than laying temperature T2 of the 2nd field, and -- field (n-1) if that is not right What is necessary is to make a sequential judgment of the above and just to carry out drive control of the maintenance motor M3 by the motorised speed and drive time amount which ask for the field of the detection temperature T and are set as the called-for field. Moreover, although the pulse motor was used as a maintenance motor in the above-mentioned example, it is not necessary to be necessarily a pulse motor. When a pulse motor is used as a maintenance motor still like the above-mentioned example, you may make it set up the movement magnitude (the amount of pulses) of this motor instead of the drive time amount of this motor.

[0016]

[Effect of the Invention] the time amount optimal at the speed which this invention detected ink temperature (ambient temperature near a print head), and was suitable for this detection temperature -- whom, since the motor which drives a tube pump is driven and ink suction speed and the amount of suction were controlled Even if ink viscosity changes with ink temperature, the optimal suction condition is formed, even if there are dispersion in the cross section of the ink passage of a nozzle and dispersion of passage resistance, there is no useless suction of ink and the air bubbles and contaminant of the ink pressure interior of a room can be removed certainly.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram of the control section of an ink jet printer which carries out one example of this invention.

[Drawing 2] It is explanatory drawing of the table which memorizes the maintenance motor drive conditions doubled with the temperature in this example.

[Drawing 3] It is the flow chart of the ink suction processing which the processor of the printer control section in this example performs.

[Drawing 4] They are the outline of a tube pump, and explanatory drawing of a method which attracts ink from the ink pressure interior of a room of a print head.

[Description of Notations]

1 Tube Pump

4 Roller

5 Rotor
6 Tube
7 Print Head
8 Nozzle Train
9 Protective Cap